REMARKS

The following numbered sections of these remarks are provided in response to similarly numbered sections of the office action.

1. The Examiner has objected to claims 7 and 9, and these claims are amended in response to the objection.

2. Claims 1-12 are rejected under 35 U.S.C. 112, second paragraph, and claims 1 and 6 are amended in response to this rejection.

3. Claims 1 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Application Publication 2002/0061030A1 (INY) in view of U.S. Patent 5,799,014 (KOZAKI). The Examiner is respectfully requested to withdraw the rejection of claims 1 and 6 in view of the following discussion distinguishing these claims over the combination of INY and KOZAKI.

Claim 1 and 6 recite a method or apparatus involving breaking incoming packets into cells, which are separately stored in memory and then forwarded from the memory. Each packet is assigned either to a "cell-by-cell" forwarding mode, or to a "sequence-by-sequence" forwarding mode based on a flow identification number (FIN) included in each packet identifying the source of the packet. Cell sequences from packets assigned to the cell-by-cell forwarding mode are alternately read out of the memory and forwarded with cells from differing packets being interleaved. A cell sequences from any packet assigned to the sequence-by-sequence forward mode is read out of the memory in uninterrupted succession without being interleaved with cells from any other sequence. Thus cell sequences derived from packets from one set of sources can be forwarded in intermingled fashion while cell sequences derived from packets from another set of sources are forwarded only in uninterrupted succession. The decision as to the forwarding mode for any cell sequence is based only on the source (as identified by the FIN number) of the packet from which the packet was derived.

The Examiner cites INY as disclosing a network switch exhibiting the recited alternative forwarding mode behavior based on FIN number. INY's network switch as illustrated in FIG. 2 includes an ingress

controller 12 at each of n switch input ports for receiving incoming packets, for breaking each packet into a cell sequence, and then forwarding each cell through a network fabric to one of a set of n egress controllers 16, each residing at a different one of n switch output port,. Each egress controller reassembles incoming cell sequences into packets and then forwards them outward from its corresponding switch output port.

The main function of INY's network switch is to route packets from its input ports to its output ports. However, one of the goals of INY's switch design is to adjust traffic flows through the switch so that when one input port receives packets at a higher rate than others, the network switch forwards cells produced by that input port at a higher rate. To help achieve that goal, each ingress controller 12 puts a time stamp on each cell they generate indicating the time at which it created that particular cell. Thus as an ingress controller 12 receives an incoming packet and converts it into a sequence of cells, it gives each cell of the sequence a different time stamp.

When an ingress controller 12 creates a time-stamped cell, it forwards it to the network fabric 14. The network fabric consists of an interconnected network of "fabric elements" 500 as illustrated in FIG. 5, each of which can receive and store an incoming cell from any of ingress controllers 12 in one of a set of n FIFO buffers 504, each for receiving cells from a different one of the n ingress controllers. Each FIFO buffer 504 stores the sequence of cells it receives in the order it receives them from its corresponding ingress controller. A sorter 506 may at any time remove the longest stored cell from any one of FIFO buffers 504 and forward it to a destination processor 508. Processor 508 stores the cell in one of another set of n FIFO buffers 512, each associated with a separate egress controller. A switch 514 forwards cells from each output FIFO buffer 512 to the corresponding egress controller.

Sorter 506 forwards only one cell at a time from the set of n FIFO buffers 504. So if some number m <= n of FIFO buffers 504 are currently storing cells, then when sorter 506 is ready to forward a next cell, it must decide which of the m cells residing at the output of those m FIFO buffers 504 it is to forward. In order to decide, it looks at the time stamp in each of those m cells, and forwards the cell having the oldest time stamp. This helps to ensure that cells

from packets arriving at a busy input port are forwarded more often that cells from packets arriving at an input port that is not so busy.

In addition to the time stamp, each cell includes a source ID (i.e. a FIN) indicating the source of the packet from which it was derived. Packet sources (i.e. FIN numbers) are ranked in order of priority. The cell also includes a "fragment" ID referencing the particular packet from which it was derived. If two or more of the m cells at the outputs of FIFO buffers 504 share the same oldest time stamp, sorter 506 chooses the cell having the highest priority. If two or more cells have the same time stamp and have the same priority, then sorter 506 chooses the cell having the lowest fragment ID.

Assume two packets (A and B) arrive at different input ports, that packet A becomes three cells A1, A2 and A3, and that packet B becomes three cells B1, B2, and B3. Let us also assume the cells were created in this order : A1, A2, B1, A3, B2, B3. If these cells are sent to FIFO buffers 504 within the same fabric element 500, then sorter 506 will forward the cells in that order. Thus at the output of sorter 506, the two cell sequences will be intermingled with one another. They will also be intermingled with sequences from other packets if cells from those other packets were created at times occurring between the times cells of packets A and B were created.

Now let us assume now that cells of packets A and B were created in this order: A1, A2, A3, B1, B2, B3. In this case, sorter 506 will forward the all cells of packet A before it forwards any cells of packet B. However that does not necessarily mean that sorter 506 will forward cells of packet A in an uninterrupted sequence, since a cell from some other packet C would interleaved with the packet A sequence departing from the output of sorter 506 it if happened to have been created some time between the times of creation of cells A1 and A3.

Thus whether sorter 506 intermingles cells from different sequences when it forwards them from FIFO buffers 504 or forwards all cells from a single packet in an unbroken sequence depends on the relative times at which the cells from the various sequences stored in FIFO buffers 504 were created, which in turn depends on the relative timing with the packets from which those cell sequences arrived at the network switch.

As discussed above, the applicant's invention as recited in claims 1 and 6 includes means for or a step of "assigning a forwarding

mode to each cell sequence in response to the FIN included in each cell sequence's corresponding packet." These claims recite that there are two kinds of forwarding modes, cell-by-cell and sequence-by-sequence. Cells of sequences assigned to the cell-by-cell mode may be forwarded from memory in intermingled fashion, whereas cells of sequences assigned to the sequence-by-sequence mode must be forwarded in an uninterrupted sequence.

It is true that when packets arrive at INY's switch during overlapping periods, INY's sorter 506 will intermingle cells of the sequence derived from those packets. It is also true that when a packet arrives at INY's switch during a time period when no other packet arrives, sorter 506 will forward the sequence of cells derived from that packet in an uninterrupted sequence. However this alternative cell-by-cell and sequence-by-sequence behavior is not controlled an assignment of each cell sequence to one of the two forwarding mode "in response to the FIN included in each cell sequence's corresponding packet" as recited in clams 1 and 6. Such behavior is determined by the relative times at which cells of the cell sequences were created, not by the sources of the packets from which the cells were derived.

It is true, as the Examiner points out, INY's sorter 506 does take into account the FIN number when deciding which cell to forward from FIFO buffers 504 (see paragraph 27), but it takes FIN into account only when cells from two sequences happen to have the same time stamp. However, although sorter 506 takes the cells' FINs into account as a "tie-breaker", it will not forward all cells of a sequence having a particular FIN before it forwards any cells having any other FIN when the packets from which those cell sequences were derived arrived during overlapping time periods. Cells of those two sequences will still be intermingled since the FIN number influences only the relative ordering of cells within the intermingled sequences and not force sorter 506 to forward cells of any one sequence in an uninterrupted manner.

Thus INY fails to teach or suggest assigning cells sequences either of the two recited forwarding modes based on FIN number of the packets from which the sequences were derived as recited in claims 1 and 6. In INY's system, whether sequences are forwarded in

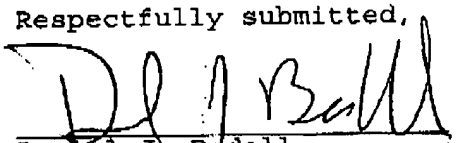
intermingled or non-intermingled fashion depends only on the relative times at which the sequences arrive at the switch.

The Examiner cites KOZAKI as teaching to read cells out of a memory when signaled to do so and teaching a queuing system for handling the signaling. However KOZAKI does not teach or suggest assigning cells sequences either of the two recited forwarding modes based on FIN number of the packets from which the sequences were derived as recited in claim 6. Thus claims 1 and 6 are patentably distinct over the combination of INY and KOZAKI

4. The Examiner has indicated that claims 2-5 and 7-12 (as amended to overcome the rejections under 35 U.S.C. 112, second paragraph) would be allowable if rewritten in independent form. However in view of the forgoing remarks distinguishing their base claims 1 and 6 over the cited prior art, the Examiner is respectfully requested to allow claims 2-5 and 7-12 (as amended) to remain in dependant form.

In view of the foregoing amendments and remarks, it is believed the application is in condition for allowance. Notice of Allowance is therefore respectfully requested.

Respectfully submitted,



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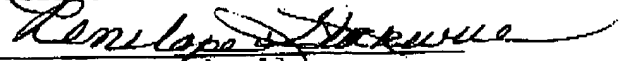

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